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(54) **SILENCED VALVE**

**GERÄUSCHARMES VENTIL**

**SOUPAPE INSONORISEE**

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**EP 1 200 760 B1**

## Description

## FIELD OF THE INVENTION

[0001] The present invention is concerned with reducing noise caused during operation of fluid control valves. In particular, the invention is concerned with valves of the type comprising a float member displaceable within a housing between closed and opened positions, responsive to fluid level and fluid dynamics within a vessel.

[0002] Such a valve is known from the document US 5 711 339.

## BACKGROUND OF THE INVENTION

[0003] Valves of the referred to type are often fitted in vehicle fuel tanks and the like. Such valves have one or more functions, e.g.: roll-over valve (ROV), over-filling interdiction valve (OFI), filling-limit vent-valve (FLVV) and on-board recovery valve (OBRV), as known in the art. Valves incorporated in vehicles' fuel tanks are a mere example. It will be appreciated, however, that such valves may be fitted in a variety of other vessels wherein fluid control is required.

[0004] Such valves typically comprise a housing fitted to the vessel, e.g. a fuel tank, with a float member displaceable within the housing, responsive to fluid level and fluid dynamics within the vessel, between closed and opened positions. Typically, when the float member is displaced into a sealing position there are provided resilient sealing means which dampen the impacting noise of the float member encountering the outlet port of the housing. However, during opening displacement of the float member, typically in a downward direction, the float member encounters a wall of the housing, resulting in an impacting noise.

[0005] In some cases there is provided a spring member slightly biasing the float member upwardly towards the closed position. However, the biasing force of this spring is essentially soft and the downward displacement of the float member overcomes the biasing spring.

[0006] During filling of a vessel and during moving of the vessel, e.g. fueling and travelling of a vehicle, respectively, the float member constantly displaces within the housing whereby an irritating clicking noise may be heard each time the float member encounters the housing.

[0007] By some proposed standards, within several years, fuel control valves within vehicle's fuel tanks will have to be provided with means for reducing that impacting noise.

[0008] It is thus an object of the present invention to provide a valve fitted with an arrangement for reducing the impacting noise between the housing and the valve member displaceable therewithin.

## SUMMARY OF THE INVENTION

[0009] It is an object of the invention to provide a silenced fuel control valve wherein displacement of the float element within the valve and its impacting against walls of the housing is essentially silent.

[0010] In accordance with the present invention there is provided a valve for a fluid tank, the valve comprising a housing formed with one or more inlet and outlet ports, side walls and a seating wall portion supporting a float-type valve member; the valve member being axially displaceable within the housing responsive to fluid level within the tank, between an uppermost position and a lowermost position; the valve member has a top and a bottom end and a bearing portion facing the seating wall portion of the housing;

the valve characterized in that either one or both of the seating wall portion of the housing and the bearing portion of the valve member, are fitted with at least one dampening member for diminishing impacting noise of the valve member encountering the housing upon displacement into the lowermost position.

[0011] In accordance with one aspect of the invention the seating wall portion of the housing is a bottom wall thereof, and the bearing portion of the valve member is a corresponding, facing bottom wall thereof.

[0012] In accordance with one specific design, the seating wall portion of the housing is a laterally extending shoulder formed adjacent a top end of the housing, and where the bearing portion of the valve member is a corresponding laterally projecting wall portion adjacent the top end thereof. By one embodiment of this design, the lateral shoulder of the housing is formed adjacent a top end of the housing, and where the bearing wall portion of the valve member is formed adjacent the top end thereof.

[0013] In accordance with a preferred embodiment of the invention, the at least one dampening member is fitted at either or both a bottom wall portion of the housing constituting the seating portion, and a bottom wall portion of the valve member housing, constituting the bearing portion.

[0014] Preferably the at least one dampening member is a resilient member axially extending from a surface of either one or both of the facing seating wall portion and the bearing wall portion.

[0015] By one specific design, the at least one resilient member extends from a bottom seating wall portion of the housing and has a valve-engaging portion upwardly projecting from a seating surface, adapted for engagement with the corresponding bottom, bearing wall portion of the valve member.

[0016] By another specific design, the at least one resilient member extends from a bearing wall portion of the valve member and has a housing-engaging portion downwardly projecting from a bearing surface thereof for engagement with a corresponding seating wall portion of the housing.

[0017] In accordance with a preferred application of the invention, the at least one resilient member is integrally formed with either or both the bottom wall portion of the housing and the bottom wall portion of the valve member.

[0018] Still preferably, the at least one resilient member is an arm attached at one end thereof to the respective wall portion, and is formed at an opposed end thereof with an axial projection for engagement with the other respective wall portion.

[0019] In order to maintain the float member axially aligned within the housing, it is preferred that at least two dampening members are provided, said dampening members being symmetrically distributed about either or both of the seating wall portion of the housing and the bearing portion of the valve member.

[0020] By one specific application of the invention, the base member is integral with the housing. By a different application the base member is attached to the housing and may thus be an add-on device, for attaching to standard valves,

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0021] For better understanding the invention and to see how it may be carried out in practice, it will now be described in a non-limiting way, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view from below, of a valve in accordance with an embodiment of the invention;

Fig. 2A is a top elevation of a base member of a housing of the valve seen in Fig. 1;

Fig. 2B is a sectional view taken along line B-B in Fig. 2A;

Fig. 3A is a sectional view along line III-III in Fig. 2A showing a portion of a float member in an upper position; and

Fig. 3B is the same as Fig. 3A, the float member in its lowermost position, engaged with a dampening member.

#### DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[0022] Referring first to Fig. 1 of the drawings, there is a general illustration of a float-type valve generally designated 10, comprising a housing 12 with a cylindrical side wall 14 and a base member 16. There is an annular shoulder portion 18 typically serving for attaching the valve to a fuel tank, and an outlet nozzle 20.

[0023] In the present example, base member 16 is attached to the housing 12 by snap-engagement by means of lateral projections 24 engaging into grooves 26 (see also Fig. 2A). A float member (not seen) is axially displaceable within the housing 12 between an upper position in which it sealingly engages an outlet port being in flow communication with nozzle 20, and a low-

ermost position in which it is disengaged from the outlet but does not interfere with inlet ports 28 formed at the base member 16.

[0024] Base member 16, as can be seen also in Figs. 2A and 2B has a central hub member 34 for supporting a lower portion of a biasing spring (not shown) bearing at one end against surface 36 of the base member 16, and at another end thereof against the float member (not shown).

[0025] Base member 16 is further formed with an annular seating surface 40 adapted for supporting the float member 42 (see Figs. 3A and 3B) when the latter is in its lowermost position.

[0026] Integrally formed with base member 16 there are, in the present example, four prong-like arms 46, connected at one end thereof to the base member and having, at their opposite, free end, an upwardly extending bulge 48 extending above the surface 40. The arrangement is such that the arms 46 are resilient and may be elastically deformed downwardly, as seen in Fig. 3B.

[0027] In the normal course of operation, the float member 42 is displaceable within the housing responsive to fluid level and within the tank and to dynamic fluid flow within the tank. Buoyancy forces together with the biasing force applied by a spring (if provided) tend to displace the float member 42 into an upward, sealing position, in which it sealingly engages the outlet port of the valve (not shown), as known *per se*. Gravity force acting on the float member tends to displace the float member away from the outlet port, into a downward, open position.

[0028] However, upon downward displacement of float member 42, under influence of gravity force, the float will overcome the force of the biasing spring (not shown) and rather than encountering the seating surface 40 of base member 16, its bottom surface 43 it will encounter bulges 48 (see Fig. 3B) entailing deformation of resilient arms 46 into the position seen in Fig. 3B in solid lines, preventing or dampening encountering of bearing surface 43 of float 42 against seating surface 40 of base member 16 with essentially reduced impacting noise.

[0029] In the present specification, a preferred embodiment has been shown and described, and it is to be understood that it is not intended thereby to limit the disclosure, but rather it is intended to cover all modifications and arrangements falling within the scope of the invention, as defined in the appended claims.

[0030] For example, different variations of valves may be used for different purposes, as indicated hereinabove. Furthermore, the location of the resilient noise dampening members may be other than at the base member of the valves. These members may also be fitted at an upper portion of the housing, e.g. where a bottom portion of the float member is exposed and projects from the housing. Furthermore, it will be appreciated that rather than having the resilient members extending from the base member, they may be formed also on the

float member or, on both the base member and the float member.

#### Claims

1. A valve (10) for a fluid tank, the valve (10) comprising a housing (12) formed with one or more inlet (28) and outlet ports (20), side walls (14) and a seating wall portion (40) supporting a float-type valve member (42); the valve member (42) being axially displaceable within the housing (12) responsive to fluid level within the tank, between an uppermost position and a lowermost position; the valve member (42) has a top and a bottom end and a bearing portion (43) facing the seating wall portion (40) of the housing (12),

the valve (10) characterized in that either one or both of the seating wall portion (40) of the housing (12) and the bearing portion (43) of the valve member (42), are fitted with at least one dampening member (48) integrally formed with either or both a wall portion of the housing (12) and a wall portion of the valve member (42) for diminishing impacting noise of the valve member (42) encountering the housing (12) upon displacement into the lowermost position.

2. A valve according to Claim 1, wherein the seating wall portion (40) of the housing (12) is a bottom wall thereof, and the bearing portion (43) of the valve member (42) is a corresponding bottom wall thereof.

3. A valve according to Claim 1, wherein the seating wall portion (40) of the housing (12) is a laterally extending shoulder formed adjacent a top end of the housing, and where the bearing portion (43) of the valve member (42) is a corresponding laterally projecting wall portion adjacent the top end thereof.

4. A valve according to Claim 3, wherein the lateral shoulder of the housing (12) is formed adjacent a top end of the housing (12) and where the bearing wall portion (43) of the valve member (42) is formed adjacent the top end thereof.

5. A valve according to Claim 1, wherein the at least one dampening member (48) is fitted at either or both a bottom wall portion of the housing (12) constituting the seating portion (40), and a bottom wall portion (43) of the valve member (42) constituting the bearing portion (43).

6. A valve according to Claim 1, wherein the at least one dampening member (48) is a resilient member axially extending from a surface of either one or both of the seating wall portion (40) and the bearing

wall portion (43).

7. A valve according to Claim 6, wherein the at least one resilient member (48) extends from a bottom seating wall portion (40) of the housing (12) and has a valve-engaging portion (48) upwardly projecting from a seating surface (40), adapted for engagement with the corresponding bottom, bearing wall portion (43) of the valve member (42).

8. A valve according to Claim 6, wherein the at least one resilient member (48) extends from a bearing wall portion (43) of the valve member (42) and has a housing-engaging portion downwardly projecting from a bearing surface thereof for engagement with a corresponding seating wall portion of the housing.

9. A valve according to Claim 6, wherein the at least one resilient member (48) is an arm attached at one end thereof to the respective wall portion (40), and is formed at an opposed end thereof with an axial projection (48) for engagement with the other respective wall portion.

10. A valve according to Claim 1, wherein at least two dampening members (48) are provided, said dampening members (48) being symmetrically distributed about either or both of the seating wall portion (40) of the housing (12) and the bearing portion (43) of the valve member (42).

11. A valve according to Claim 2, wherein the housing (12) is essentially cylindrical and the bottom wall is attached thereto.

#### Patentansprüche

1. Ventil (10) für einen Fluidbehälter, wobei das Ventil (10) ein mit einer oder mehreren Einlaß (28)- und Auslaß-Öffnungen (20), Seitenwänden (14) und einem Wandabschnitt als Sitz (40), der ein Ventiltteil (42) vom Schwimmtyp unterstützt, ausgebildetes Gehäuse (12) umfaßt, das Ventiltteil (42) in dem Gehäuse (12) in Reaktion auf die Fluidhöhe in dem Behälter zwischen einer obersten und einer untersten Stellung axial verschiebbar ist, das Ventiltteil (42) ein oberes Ende und ein Bodenende sowie einen Lagerabschnitt (43) besitzt, welcher zu dem als Sitz ausgebildeten Wandabschnitt (40) des Gehäuses (12) hin blickt, **dadurch gekennzeichnet, daß** bei dem Ventil (10) entweder eines oder beide, der als Sitz ausgebildete Wandabschnitt (40) des Gehäuses (12) und der Lagerabschnitt (43) des Ventiltteils (42), mit wenigstens einem Dämpfungsteil (48) ausgestattet sind, welches integral mit einem oder beidem, einem Wandabschnitt des Gehäuses (12) und einem Wandabschnitt des Ventiltteils (42), zur Ver-

- minderung des Schlaggeräusches des Ventiltails (42), das in den als Sitz aus- gebildeten Wandabschnitt (40) des Gehäuses (12) bei Verschieben in die unterste Position ausgebildet ist.
- 2. Ventil nach Anspruch 1, bei dem der als Sitz aus- gebildete Wandabschnitt (40) des Gehäuses (12) eine Bodenwand desselben ist und der Lagerabschnitt (43) des Ventiltails (42) eine entsprechende Bodenwand desselben ist.
- 3. Ventil nach Anspruch 1, bei dem der als Sitz aus- gebildete Wandabschnitt (40) des Gehäuses (12) eine sich seitlich erstreckende Schulter ist, die in Nachbarschaft zum oberen Ende des Gehäuses ausgebildet ist, und der Lagerabschnitt (43) des Ventiltails (42) ein entsprechend seitlich vorsprin- gender Wandabschnitt in Nachbarschaft zu seinem oberen Ende ist.
- 4. Ventil nach Anspruch 3, bei dem die seitliche Schul- ter des Gehäuses (12) in Nachbarschaft zu dem oberen Ende des Gehäuses (12) ausgebildet ist und der als Lager ausgebildete Wandabschnitt (43) des Ventiltails (42) in Nachbarschaft zu seinem oberen Ende ausgebildet ist.
- 5. Ventil nach Anspruch 1, bei dem wenigstens ein Dämpfungsteil (48) an einem oder beidem, einem Bodenwandabschnitt des Gehäuses (12), der den Sitzabschnitt (40) darstellt, und einem Bodenwandabschnitt (43) des Ventiltails (42), der den Lagerabschnitt (43) darstellt, ausgestattet ist.
- 6. Ventil nach Anspruch 1, bei dem das wenigstens eine Dämpfungsteil (48) ein elastisches Teil ist, das sich von einer Oberfläche eines oder beider, des Sitzwandabschnittes (40) und des Lagerwandabschnittes (43) aus axial erstreckt.
- 7. Ventil nach Anspruch 6, bei dem sich wenigstens ein elastisches Teil (48) von einem Bodensitzwandabschnitt (40) des Gehäuses (12) aus erstreckt und einen an dem Ventil angreifenden Abschnitt (48) hat, der sich von einer Sitzoberfläche (40) aus nach oben erstreckt, wobei die Sitzoberfläche für einen Eingriff an dem entsprechenden Bodenlagerwandabschnitt (43) des Ventiltails (42) ausgebildet ist.
- 8. Ventil nach Anspruch 6, bei dem sich wenigstens ein elastisches Teil (48) von einem Lagerwandabschnitt (43) des Ventiltails (42) aus erstreckt und einen am Gehäuse angreifenden Abschnitt hat, der sich abwärts von einer Lageroberfläche desselben aus erstreckt, um an einem entsprechenden Sitzwandabschnitt des Gehäuses anzugreifen.
- 9. Ventil nach Anspruch 6, bei dem wenigstens ein

elastisches Teil (48) ein an einem Ende desselben zu dem entsprechenden Wandabschnitt (40) ange- setzter Arm ist und an einem entgegengesetzten Ende desselben mit einem axialen Vorsprung (48) zum Angriff an dem anderen jeweiligen Wandabschnitt ausgebildet ist.

- 10. Ventil nach Anspruch 1, bei dem wenigstens zwei Dämpfungsteile (48) vorgesehen sind, wobei die Dämpfungsteile (48) symmetrisch um eines oder beide des Sitzwandabschnittes (40) des Gehäuses (12) und des Lagerabschnittes (43) des Ventiltails (42) verteilt sind.

- 11. Ventil nach Anspruch 2, bei dem das Gehäuse (12) im wesentlichen zylindrisch ist und die Bodenwand daran angesetzt ist.

## 20 Revendications

- 1. Soupape (10) pour un réservoir de fluide, la soupape (10) comprenant une chambre (12) formée avec un ou plusieurs orifices (28) d'entrée et (20) de sortie, des parois latérales (14) et une partie (40) de paroi de siège supportant un élément (42) de soupape de type flottant, l'élément (42) de soupape pouvant se décaler axialement à l'intérieur de la chambre (12) en réponse à un niveau de fluide à l'intérieur du réservoir, entre une position la plus haute et une position la plus basse ; l'élément (42) de soupape comporte une extrémité supérieure et une extrémité inférieure et une partie (43) d'appui faisant face à la partie (40) de paroi de siège de la chambre (12) ;

la soupape (10) étant caractérisée en ce que l'une ou l'autre de la partie (40) de paroi de siège de la chambre (12) et de la partie (43) d'appui de l'élément (42) de soupape, ou les deux, sont équipées d'au moins un élément (48) d'amortissement formé d'un seul tenant avec l'une ou l'autre d'une partie de paroi de la chambre (12) et d'une partie de paroi de l'élément (42) de soupape, ou les deux, dans le but de réduire le bruit d'impact de l'élément (42) de soupape rencontrant la chambre (12) lors du décalage dans la position la plus basse.

- 2. Soupape selon la revendication 1, dans laquelle la partie (40) de paroi de siège de la chambre (12) est sa paroi inférieure, et dans laquelle la partie (43) d'appui de l'élément (42) de soupape est sa paroi inférieure correspondante.
- 3. Soupape selon la revendication 1, dans laquelle la partie (40) de paroi de siège de la chambre (12) est un épaulement s'étendant latéralement, formé adjacent à une extrémité supérieure de la chambre, et dans laquelle la partie (43) d'appui de l'élément

- (42) de soupape est une partie de paroi en saillie latéralement correspondante, adjacente à son extrémité supérieure.
4. Soupape selon la revendication 3, dans laquelle l'épaulement latéral de la chambre (12) est formé adjacent à une extrémité supérieure de la chambre (12), et dans laquelle la partie (43) de paroi d'appui de l'élément (42) de soupape est formée adjacente à son extrémité supérieure.
5. Soupape selon la revendication 1, dans laquelle l'au moins un élément (48) d'amortissement est prévu au niveau de l'une ou l'autre d'une partie de paroi inférieure de la chambre (12) constituant la partie (40) de siège et d'une partie (43) de paroi inférieure de l'élément (42) de soupape constituant la partie (43) d'appui, ou au niveau des deux.
6. Soupape selon la revendication 1, dans laquelle l'au moins un élément (48) d'amortissement est un élément élastique s'étendant axialement d'une surface de l'une ou de l'autre de la partie (40) de paroi de siège et de la partie (43) de paroi d'appui, ou des deux.
7. Soupape selon la revendication 6, dans laquelle l'au moins un élément élastique (48) s'étend d'une partie inférieure (40) de paroi de siège de la chambre (12) et comporte une partie (48) d'engagement de soupape en saillie vers le haut de la surface (40) de siège, conçue pour engagement avec la partie inférieure (43) de paroi d'appui correspondante de l'élément (42) de soupape.
8. Soupape selon la revendication 6, dans laquelle l'au moins un élément élastique (48) s'étend d'une partie (43) de paroi d'appui de l'élément (42) de soupape et comporte une partie d'engagement de chambre en saillie vers le bas de sa surface d'appui pour engagement avec une partie de paroi de siège correspondante de la chambre.
9. Soupape selon la revendication 6, dans laquelle l'au moins un élément élastique (48) est un bras fixé, à son extrémité, à la partie (40) de paroi respective, et est formé, à son extrémité opposée, avec une saillie axiale (48) pour engagement avec l'autre partie de paroi respective.
10. Soupape selon la revendication 1, dans laquelle au moins deux éléments (48) d'amortissement sont prévus, lesdits éléments (48) d'amortissement étant répartis symétriquement autour de l'une ou de l'autre de la partie (40) de paroi de siège de la chambre (12) et de la partie (43) d'appui de l'élément (42) de soupape, ou autour des deux.
11. Soupape selon la revendication 2, dans laquelle la chambre (12) est essentiellement cylindrique et dans laquelle la paroi inférieure y est fixée.

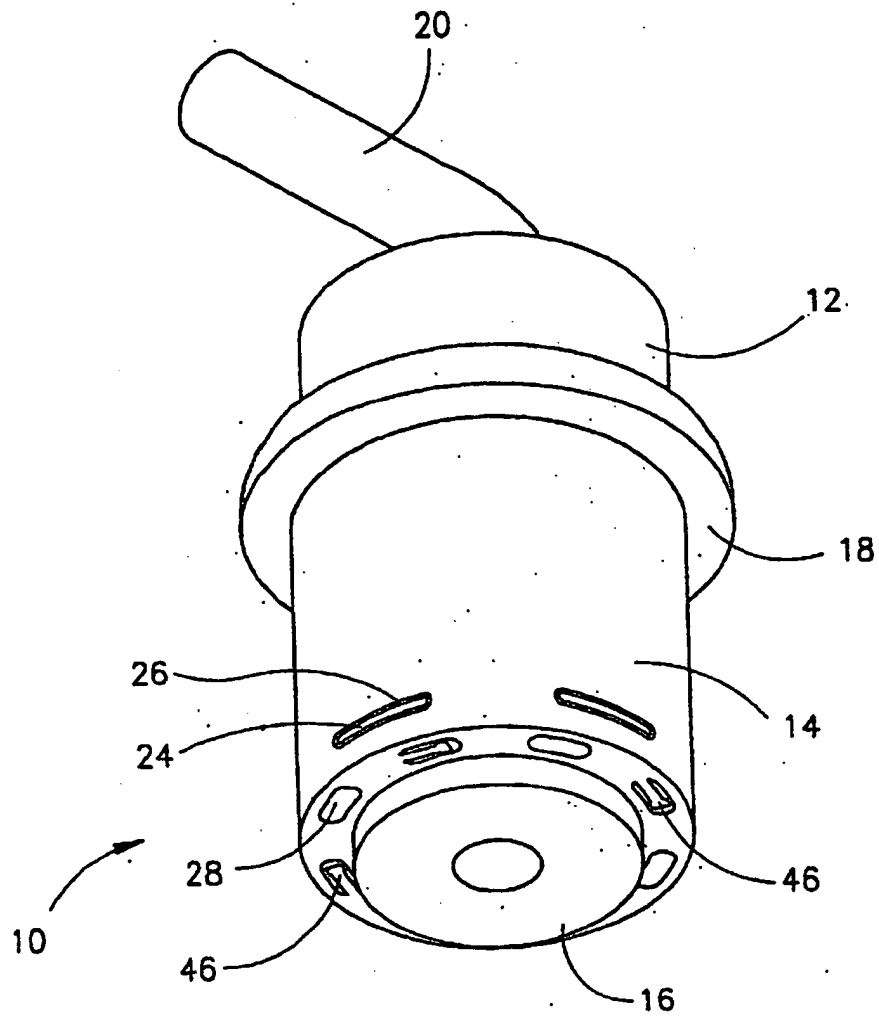


FIG.1

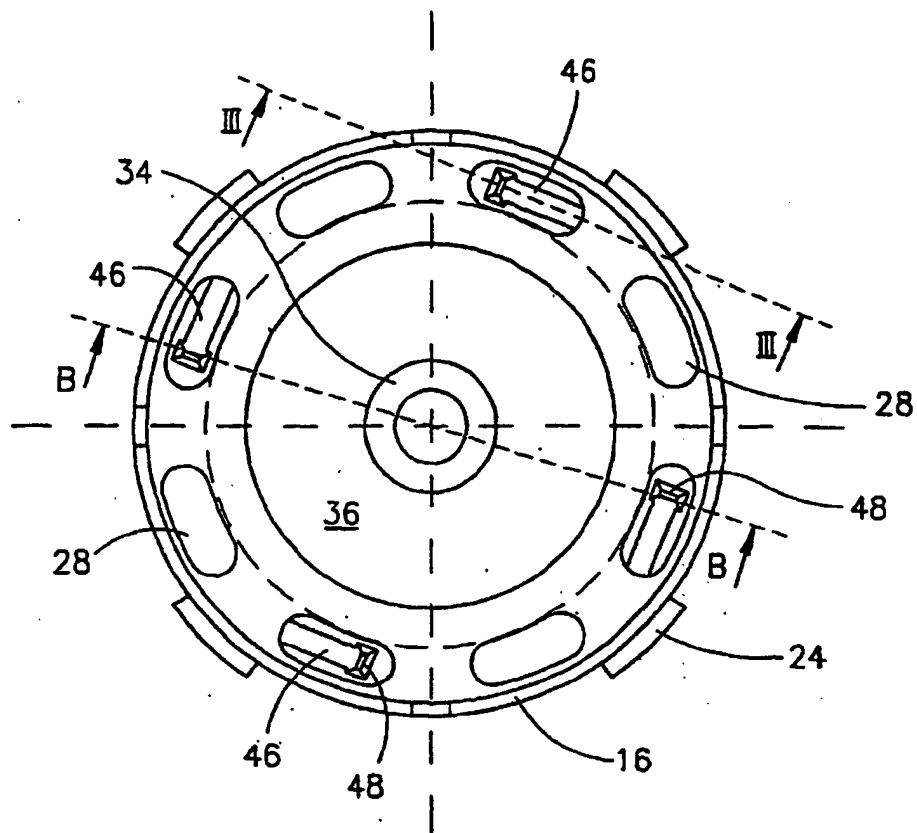


FIG. 2A

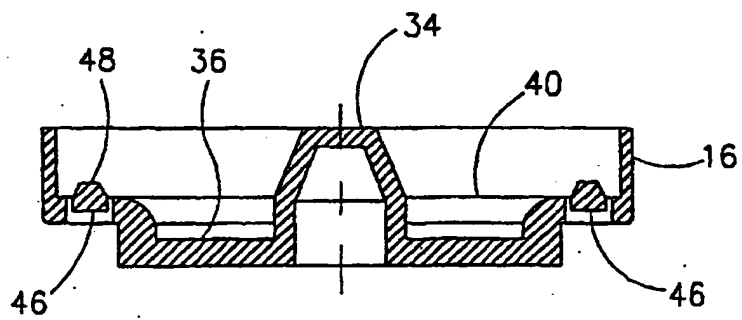


FIG. 2B



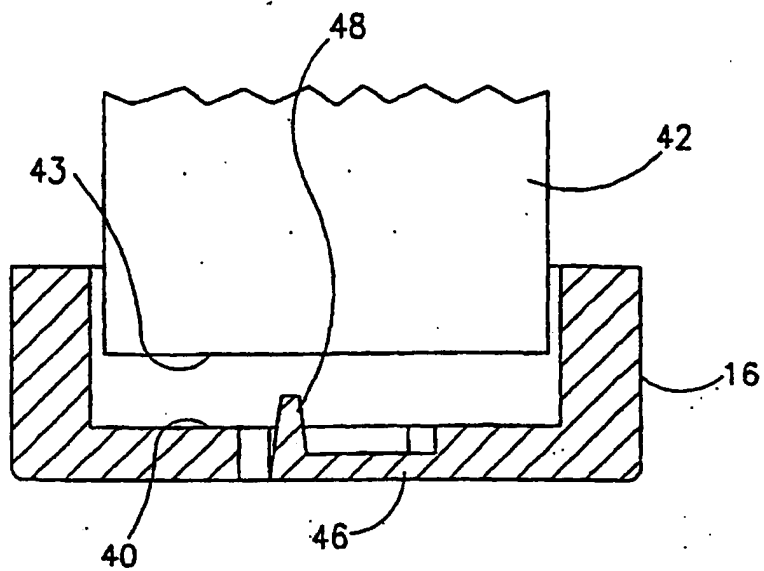


FIG.3A

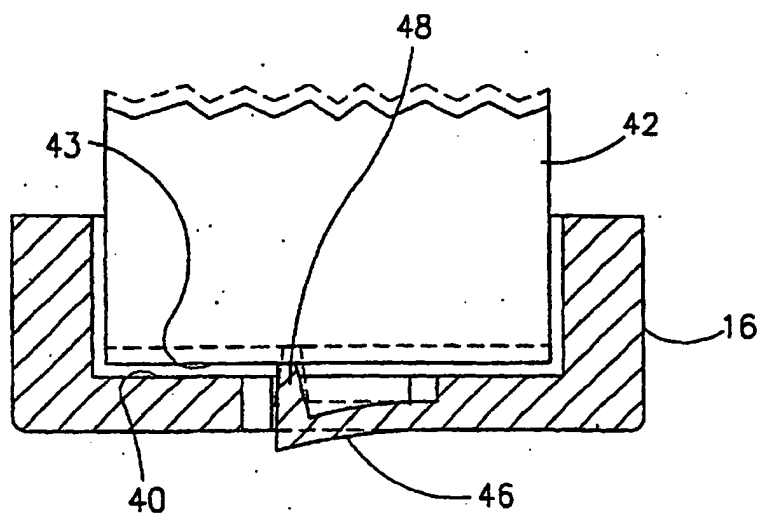


FIG.3B